WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2005NC47B

Title: Characterization of Surface Water/Ground Water Interactions along the Tar River using Ground Penetrating Radar

Project Type: Research

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Abstract

Water demand in North Carolina will increase as the population expands from 8 million (2000) to the expected 12.5 million in 2030. In the Tar River Basin residents rely on both ground water and surface water and it is estimated that water demand in the Tar River basin will increase by 55% between 1997 and 2020. Aquifer withdrawals have resulted in less upward movement of ground water to discharge areas and aquifer dewatering. Water supplies are critical to the economic well being of North Carolina's Coastal Plain, yet few studies detail the river-ground water relationships that exist here. Published piezometric and ground water surface data are rarely available near rivers and it is commonly assumed that ground water flows perpendicular to rivers. However, ground water flow near rivers is often dominated by underflow (ground water flow parallel to the river). In perched settings,ground water flow near rivers may be minimal. Information on the nature of ground water flowpaths near Coastal Plain rivers and the hydraulic properties of surficial aquifer, floodplain, and active channel sediments can improve water

management decisions. This knowledge is critical to predicting the fate and transport of contaminants from spills and leaking underground tanks that occur near Coastal Plain rivers. Past river-ground water interaction studies have utilized piezometers, ground water flow models, seepage runs, and inferences made from water temperature, water chemistry and isotopic composition data. Studies show that active channel sediment hydraulic properties are typically very heterogeneous. Numerous piezometers are required to adequately characterize hydraulic properties of an active river channel. Piezometer installation and monitoring in river channels is difficult and expensive. Practical techniques are needed to characterize the geological framework of the active river channel that controls the river's relationship with the ground water system. In this study, we propose to use ground penetrating radar (GPR) as a tool to characterize active channel sediments and stratigraphy underlying the Tar River and compare GPR transects with measured hydraulic conductivity and ground water input data. The goal is to define the relationship between the shallow (<15 m deep) stratigraphic framework (nature, extent, and position of confining beds and aquifers) and the spatial and temporal variability of stream-ground water interactions. These techniques may be applied to a wide range of river settings.